



## AI Power Learning Technologies and English Learning Advancement: A Quasi Experiment Approach

Hafiz Wajid Ali Jawwad Sialvi<sup>a, \*</sup>, Aftab Ahmad Khan<sup>a</sup>, Munir Ahmad<sup>b</sup>

<sup>a</sup> Department of Education, University of Jhang, Jhang, Pakistan

<sup>b</sup> Govt. Higher Secondary School Chak 232 J.B, School Education Department, Jhang, Pakistan

### ARTICLE INFO

#### Article History:

Received 16 March 2026

Accepted 28 March 2026

Available online 27 April 2026

#### Keywords:

Artificial Intelligence

Duolingo, Motivation

Engagement

English Language

Learning

Achievements

### ABSTRACT

This The development of technology has led to the development of digital language learning tools. This study examined The Effect of Duolingo on English Language Achievement at Secondary Level. The study was quasi-experimental experimental in nature and non-equivalent control group design was used. In this study we selected two schools, one for experimental and other as controlled group. Two different groups of 80 student were used for experiment. The findings reveal that students who used Duolingo saw a statistically significant improvement in the outcomes of their English language achievement. This research investigated Duolingo's impact on secondary school English proficiency. The study also investigates Duolingo's impact on secondary English students' motivation and secondary level students' English learning. Additionally, the results showed that AI-powered language learning software programs, especially Duolingo, may be able to work well compared to traditional teaching methods. The effect size (Eta2) number was 0.52, which means that the treatment had a big effect and the experimental group did very well after it. The Ministry of Education should think about whether to include programs such as Duolingo that use artificial intelligence in the National English Language Curriculum. This would help students improve their vocabulary and grammar and would also help the government save money on digital infrastructure.

### Introduction

English learning ability is becoming necessary. It aids academic progress, job advancement, and worldwide communication. Effective teaching practices that improve English language competency, student enthusiasm, and engagement are in high demand in Pakistan, where English is taught as a second language. Traditional teaching methods sometimes fail to interest pupils in English learning, especially in rural Pakistan like Tehsil Jhang, where students often struggle with motivation and may benefit from more interactive and student-centered approaches. Over 1.5 billion people speak English, making it the most spoken language. Santosa, M. H., Harismayanti, I., & Putra, I. N. A. J. (2022).

The advancement of technology has facilitated the emergence of digital language learning tools. It offers promising alternatives to traditional classroom instruction. Among these, Duolingo, an application powered by artificial intelligence for language acquisition, has garnered significant acclaim. It fosters autonomous learning through its captivating, game-inspired approach. Duolingo presents a user-friendly interface, provides prompt feedback, and incorporates a reward system that has the potential to elevate student motivation and engagement. Gamification is being used by more English teachers to improve their lessons (Inayah, Yusuf, & Fibula, 2020).

Technology has created digital language learning aids. It offers excellent alternatives to classroom learning. Duolingo, an AI-driven language learning program, is popular as an alternate classroom learning tool while teaching English as a second language. Engaging, game-like style encourages autonomous learning. An appealing design, fast feedback, and an incentive system might motivate and engage students on Duolingo, especially in overcoming the challenges faced by Pakistani educators and learners in rural areas like Tehsil Jhang.

Pakistani educators and learners have several challenges while learning English, particularly in rural areas like Tehsil Jhang. Some of them are as follows: Due to little exposure to English outside of the classroom, children have limited opportunities to practice the language in everyday interactions. The pronunciation, syntax, and sentence structure are influenced by Urdu, Punjabi, and other local languages. Riaz, S., Arshad, M., & Khalil, B. (2023). Many parents lack English proficiency and are illiterate. Many students experience anxiety during English interactions, fearing ridicule or making mistakes, which leads to decreased participation. Many English language teachers, especially in public institutions, lack fluency and confidence in their spoken English abilities.

\* Corresponding author.

E-mail address: [hafizwajidsialvi@gmail.com](mailto:hafizwajidsialvi@gmail.com) (H. W. A. J. Sialvi).

This research tries to explore how Duolingo affects learning achievement in the English language. Access to high-quality English language teaching is limited in Tehsil Jhang, which negatively impacts students' ability to learn effectively and may lead to lower overall proficiency in English. It further examines how Duolingo might bridge learning gaps and boost student English as a second language learning interest. The world is changing rapidly. It is shifting from industrial to media-driven and information-based. This progression shows that there are many ways to do a job, both past and current. Twenty years ago, chores were done manually, but media innovations have made them more efficient, allowing for tasks such as scheduling, communication, and information retrieval to be completed quickly and easily. Modern media allows people to do many things with a single click. Our schools are no exception. Technological gadgets may increase language learning and methodological efficiency by taking instruction beyond time and space boundaries. Hasif, A. F., & Darmi, R. (2024).

Technological gadgets and mobile multimedia devices and apps have opened new horizons for learning English. Many practical and theoretical conversations about mobile devices help explain their benefits and drawbacks. Mobile devices may allow mobile learning, but without a smart strategy, they provide no more advantage to our kids than any other technology, as they can lead to distractions and ineffective learning if not integrated thoughtfully into the educational process. When we peep into the era where technological gadgets were in their early developmental stages, teachers issued textbook projects or chalkboard questions for pupils to complete at home. Nowadays technology has changed the whole scenario. This scenario lets students use a mobile phone app to complete tasks. Duolingo provides gamified content. Levels, experience points, and other video game ideas will be encountered, which are designed to enhance student engagement and motivation in the learning process. Levels of difficulty demand experience points to navigate through the lesson.

This study aims to examine the effectiveness of Duolingo as a supplementary learning tool among secondary-level students. Specifically, it seeks to determine its effect on English language learning achievement, as well as its influence on students' motivation towards learning English, measured through a motivation questionnaire. In addition, the study investigates the extent to which Duolingo enhances student engagement in English language learning activities, using both engagement questionnaires and observational methods. Accordingly, the study addresses the following research questions: what is the effect of using Duolingo on students' English language achievement; whether its use significantly influences students' motivation levels; and to what extent it impacts their engagement in learning activities.

### Significance

The results of this research study may provide empirical information to assist educators and policymakers in Pakistan about the integration of mobile language learning apps, such as Duolingo, into the English language curriculum or as extra educational aids in schools. They may help make choices on how to design the curriculum, how to spend money on technology-enhanced learning, and how to make rules for using Mobile Assisted Language Learning (MALL) in schools. These results may assist in adapting teacher training programs to provide teachers the knowledge and abilities to use such technologies successfully. The data will also show whether Duolingo improves Pakistani pupils' English language skills, which might boost academic achievement and employment prospects. If the research shows that gamified mobile apps boost motivation and engagement, they may help Pakistani students learn languages more easily and sustainably. In an environment where conventional tactics may lack engagement, this knowledge is crucial. Understanding how Duolingo impacts learning may reveal its ability to fill learning gaps or accommodate Pakistani learners' unique learning methods, such as their preference for interactive and culturally relevant content that resonates with their experiences. Learners may use the results to make evidence-based judgments about their use of Duolingo.

In Pakistan, higher education and many private schools teach science, technology, engineering, and math in English. English proficiency is necessary for academic success and high-quality education. Global organizations, government sectors, and Pakistan's fast-growing tech industry value English ability and sometimes require it for employment opportunities and career advancement. English facilitates global communication, research, news, and internet resources. English proficiency is more important in a globalized world. Smartphone ownership and internet connection have increased in Pakistan (Mujahid, Nasir, Bashir, & Jehangir, 2024). Students in Grade 9 from selected public institutions in Tehsil Jhang are the focus of this investigation. The English content is derived from the 9th-grade English curriculum that was established by the Punjab Textbook Board. The timeframe of the study encompasses a specific duration of interaction with Duolingo (e.g., 6-8 weeks), which could restrict the ability to observe long-term effects.

Participants in the experimental group utilizing Duolingo will be limited to those who possess fundamental access to smartphones and internet connectivity. The study focuses on Duolingo-facilitated reading, vocabulary, grammar, and foundational speaking/listening practice, not on advanced language competencies or writing skills.

### Literature Review

A fresh investigation has shown that technology-enhanced teaching methods have the power to change the way people learn. Adaptive Learning Technologies (ALT) help students remember language better, stay motivated, and feel less anxious (Ortikov, U. K. U. 2024; Hamzah, F., Abdullah, A. H., & Ma, W. 2024). Offering realistic and engaging settings is hard because of limitations in infrastructure and training. Traditional verbal and task-oriented methods are being improved at the same time (Zhou, Y., & Divekar, R. 2025).

The main focus of studies on Duolingo was on how to use this technology to help people learn new words. The study looked into how the Duolingo app can help people improve their speaking and listening skills. It found that using Duolingo has a good effect on speaking skills. Santi and Hilal (2023). A study by Laksmi and Anugerahwati (2023) used a quasi-experimental design with only a post-test to look at how the Duolingo app affected students' English language skills.

Umali (2024) looked at how to handle artificial intelligence technology in terms of how it affects teacher and student enthusiasm and the problems that come up. The study looked at how Artificial Intelligence (AI) technology was used and managed in private schools in Calamba City, Laguna. Specifically, it looked at how it affected how teachers did their jobs and how motivated students were to learn.

In the area of education, keeping students motivated is key to getting them to learn well and really understand what they are being taught. In order to become experts in their field, students need to be very motivated to do well. That's why teachers have looked into a number of ways to boost motivation in the classroom. Using Artificial Intelligence (AI) technology in the classroom has been shown to increase student enthusiasm and involvement, especially through

## AI Power Learning Technologies and English

personalized learning and feedback systems that change based on the student. The year 2020: Aldulaimi and Abduldayem Duolingo is an extra tool for learning languages. You can use it on the web (duolingo.com) or on your phone as an app. People who want to learn a language love this program so much that it now has about 300 million students and is still growing. Also see Salmanpour, Tabatabaei, Salehi, and Yunus (2024). According to Shortt, Tilak, Kuznetcova, Martens, and Akinkuolie (2023), Duolingo, a game-based language learning app, has more than 300 million players around the world. Perez (2020) said that to use Duolingo, you need a stable internet link and gadgets that work with it

Solmaz (2024) looked into how digital mobile apps have changed learning a foreign language by making teaching materials more approachable and interesting. In 2021, Jaelani and Sutari looked at how people used the Duolingo app to learn words. The results show that Duolingo is a great app for learning new words because it has many features that make it easier for the brain to combine language, especially its game-like learning style and personalized feedback systems that work with different learning speeds. According to research by Portnoff, Gustafson, Rollinson, and Bicknell in 2021, standard tasks alone are not enough to fully test self-directed learning platforms like Duolingo because students choose how to study and when to review material.

Wati and Pratiwi (2025) conducted an examination of students in the fashion management (TB) and institutional financial accounting (AKL) programs at SMK Ma'arif 1 Metro in the grade XI. In order to enhance their reading, writing, and speaking abilities, both regions implement English vocabulary in their educational programs. Duolingo's assets, drawbacks, and optimal integration strategies for English instruction in higher education were examined by Gollum (2024). Duolingo's AI-driven algorithms, accessibility, flexibility, and personalized learning experience enhance student engagement through gamification, rendering it particularly effective for diverse learners in a variety of educational contexts.

Duolingo is an effective instrument for language acquisition, as evidenced by all of the studies mentioned above. Nevertheless, these studies are primarily conducted in the United States, Canada, Taiwan, China, Colombia, and other locations. Despite Pakistan's significant progress in mobile technology, there is still a scarcity of research on this subject.

## Method and Material

The present research study was an effort to examine the effect of Duolingo on English language achievement at the secondary. It was a quasi-experimental study and non-equivalent control group design was used. This chapter contains detailed description of the research technique, study sample, instrument for data collection, ensuring validity and reliability of the instrument, and the duration of the investigation.

## Research Instruments and Experimental Procedure

The study's population comprised all public sector male and female high and higher secondary schools. They were 116 in total. Due to cultural norms only, male schools were focused. Out of them only two schools were randomly selected for the study. One was assigned to as the school of control group and the other was as the school of experimental group. Both control and experimental group consisted of 40 students each.

The instrument used in this research study was a self-developed achievement test. The instrument consisted of 30 items. The items were categorized as 10 items related to grammar, 15 items related to vocabulary and 5 items related to comprehension. A scoring rubric was also developed by the researcher. Both the instrument and the rubric are given in the appendices. The instrument was validated by the English language experts and experts in the field of education. The instrument was pilot-tested and reliability was ensured using Cronbach Alpha. The reliability coefficient was .75.

Before the treatment starts, both control and experimental groups were pretested. Then the control group was taught using traditional talk and chalk method. And the experimental group received treatment using Duolingo AI Powered tutoring tool as a supplementary tool. The students had their cell phones and tabs with updated Duolingo App. Computer lab of the school was also used during the experiment. All the gadgets had the internet facility. The treatment span was for six weeks. After the treatment was over, both groups were post tested.

## Results and Discussion

This research is expected to contribute to the understanding of the role of AI-powered tutoring systems in promoting student motivation and engagement. The findings may inform the development of more effective educational technologies and inform educational policy decisions. The answer scripts of both pre- and posttest were scored according to the guidelines given in the scoring rubric. The data obtained was put into SPSS and analyzed. The outcome was then arranged into a table and succinctly reported.

Table 1 Comparison of Control and Experimental Group on Vocabulary items before the treatment

Items	Total Score	Group	N	Mean	SD	T	df	P
Vocabulary items	10	Control	40	3.78	1.387	5.028	78	0.000
		Experimental		2.33	1.185			

Table 1 shows the comparison of control and the experimental groups before the treatment on vocabulary items. Mean value of control group was 3.78 and experimental group (2.33). The Standard Deviation (SD) was 1.387 and 1.185 for control and experimental group respectively. Degrees of freedom was 78 for both groups. Levene's Test for Equality of Variances yields a significance level of 0.142 (> 0.05), indicating that equal variances are acknowledged. Sig. (2-tailed) = 0.000, which is highly significant ( $p < 0.001$ ), was calculated for the T-test for Equality of Means with  $t = 5.028$ . and  $df = 78$ . The experimental Group has a mean difference of 1.450.

Table 2 Comparison of Control and Experimental Group on Grammar items before the treatment

Unit	Total Score	Groups	N	Mean	SD	t	df	P
------	-------------	--------	---	------	----	---	----	---

Unit	Total Score	Groups	N	Mean	SD	t	df	P
Grammar items	15	Control	40	5.13	2.451	1.809	78	0.074
		Experimental		4.28	1.679			

In Table 2 showing the results of Pretest sub section the current experiment i-e Grammar. The total score of this section were 15. Forty (40) students were examined during the experiments. Mean value of control group was 5.13 and experimental group (4.28). The Standard Deviation (SD) was 2.451 and 1.679 for control and experimental group respectively. Levene's Test for Equality of Variances yields insignificance level of 0.013 ( $< 0.05$ ), indicating that equal variances are acknowledged. Sig. (2-tailed) = 0.074, which is significant at 0.07% ( $p > 0.001$ ), was calculated for the T-test for Equality of Means with  $t = 1.809$ . and  $df = 78$ . The experimental Group has a mean difference of 0.850.

Table 3 Comparison of Control and Experimental Group on items involving Comprehension before the treatment

Unit	Total Score	Groups	N	Mean	SD	t	df	P
Comprehension items	05	Control	40	2.68	1.269	1.643	78	0.104
		Experimental		2.18	1.448			

Table 3 showing the results of Pretest sub section the current experiment i-e Comprehension. The total score of this section were 05. Forty (40) students were examined during the experiments. Mean value of control group was 2.68 and experimental group (2.18). The Standard Deviation (SD) was 0.623 and 1.448 for control and experimental group respectively. Levene's Test for Equality of Variances yields insignificance level of 0.432 ( $> 0.05$ ), indicating that equal variances are acknowledged. Sig. (2-tailed) = 0.104, which is insignificant ( $P > 0.05$ ), was calculated for the T-test for Equality of Means with  $t = 1.643$ . and  $df = 78$ . The experimental Group has a mean difference of 0.500.

Table 4 Comparison of Control and Experimental Group before the treatment (All Items i-e Vocabulary, Grammar, Comprehension)

Unit	Total Score	Groups	N	Mean	SD	T	df	P
All items i-e Vocabulary, Grammar and Comprehension items	30	Control	40	11.50	3.552	3.681	78	0.000
		Experimental		8.78	3.051			

In Table 4 is presenting the pre-test results concerning to the investigation of a given situation of the control and experimental groups. The mean value of the control group was (11.50) and the experimental group was (8.78). The Standard Deviation (SD) of the experimental group was found (3.051) and Control Group (3.552). Total number of students involved in this study were (40). The total scores of the tests were (30). Levene's Test for Equality of Variances yields a significance level of 1.523 ( $> 0.05$ ), indicating that equal variances are presumed. Sig. (2-tailed) = 0.000, which is highly significant ( $p < 0.001$ ), was calculated for the T-test for Equality of Means with  $t = 3.681$  and  $df = 78$ . The experimental group has a mean difference of 2.725.

Table 5 Comparison of Control and Experimental Group on Vocabulary items after the treatment

Unit	Total Score	Groups	N	Mean	SD	t	df	P
Vocabulary items	10	Control	40	4.15	1.406	-10.15	78	0.000
		Experimental		7.55	1.584			

The Table 5 shows the results of Posttest of sub section the current experiment i-e Vocabulary. The total score of this section were 10. Forty (40) students were examined during the experiments. Mean value of control group was 4.15 and experimental group (7.55). The Standard Deviation (SD) was 1.406 and 1.584 for control and experimental group respectively. Levene's Test for Equality of Variances yields significance level of 0.506 ( $> 0.05$ ), indicating that equal variances are acknowledged. Sig. (2-tailed) = 0.000, which is significant ( $P > 0.05$ ), was calculated for the T-test for Equality of Means with  $t = 10.15$ . and  $df = 78$ . The experimental Group has a mean difference of 3.40. The Eta2 value was 0.56 which shows that it has large effect and excellent achievement of experimental group after the treatment.

Table 6 Comparison of Control and Experimental Group on Grammar items after the treatment

Unit	Total Score	Groups	N	Mean	SD	T	df	P
Grammar items	15	Control	40	5.95	2.309	-6.21	78	0.000
		Experimental		9.98	2.032			

Table 6 shows the results of Posttest of sub section the current experiment i-e Grammar. The total score of this section were 15. Forty (40) students were examined during the experiments. Mean value of control group was 5.95 and experimental group (8.98). The Standard Deviation (SD) was 2.309 and 2.032 for control and experimental group respectively. Levene's Test for Equality of Variances yields significance level of 0.476 ( $> 0.05$ ), indicating that equal variances are acknowledged. Sig. (2-tailed) = 0.000, which is significant ( $P > 0.05$ ), was calculated for the T-test for Equality of Means with  $t = -6.21$ . and  $df = 78$ . The experimental Group has a mean difference of -3.03.

Table 7 Comparison of Control and Experimental Group on items involving Comprehension after the treatment.

Unit	Total Score	Groups	N	Mean	SD	T	df	P
Comprehension items	05	Control	40	2.80	0.939	-2.76	78	0.007
		Experimental		3.38	0.925			

According Table 7 shows the results of Posttest of sub section the current experiment i-e Comprehension. The total score of this section were 05. Forty (40) students were examined during the experiments. Mean value of control group was 2.80 and experimental group (3.38). The Standard Deviation (SD) was 0.939 and 0.925 for control and experimental group respectively. Levene's Test for Equality of Variances yields significance level of 0.489 ( $> 0.05$ ), indicating that equal variances are acknowledged. Sig. (2-tailed) = 0.007, which is significant ( $P > 0.05$ ), was calculated for the T-test for Equality of Means with  $t = -2.76$ . and  $df = 78$ . The experimental Group has a mean difference  $-0.575$ . The ETA value was 0.09 which shows that it has large effect and excellent achievement of experimental group after the treatment. About 9% of the variances is explained by the groups.

Table 8 Comparison of Control and Experimental Group after the treatment (All items i.e Vocabulary, Grammar and Comprehension)

Unit	Total Score	Groups	N	Mean	SD	T	Df	p
All items i-e Vocabulary, Grammar and Comprehension items	30	Control	40	12.98	3.278	-9.25	78	0.000
		Experimental		20.00	3.508			

Table 8 is presenting the post-test results regarding the study of a given situation of the control and experimental groups. The mean value of the control group was (12.98) and the experimental group was (20.00). The Standard Deviation (SD) of the experimental group was found (3.508) and Control Group (3.278). Total number of students involved in this study were (40). The total scores of the tests were (30). Levene's Test for Equality of Variances yields a significance level of 0.865 ( $> 0.05$ ), indicating that equal variances are acknowledged. Sig. (2-tailed) = 0.000, which is highly significant ( $p < 0.001$ ), was calculated for the T-test for Equality of Means with  $t = -9.25$  and  $df = 78$ . The experimental Group has a mean difference of  $-7.025$ .

There is a statistically significant difference between the post-test scores of the control and experimental groups ( $p < .001$ ). The experimental group scored significantly higher ( $M = 20.00$ ) than the control group ( $M = 12.98$ ), with a mean difference of 7.025. This suggests that the intervention used in the experimental group (e.g., Duolingo or any other method) was effective in improving post-test performance. The ETA value was 0.52 which shows that it has large effect and excellent achievement of experimental group after the treatment. About 52% of the variances is explained by the groups.

Table 9 T- Statistics Both Groups Results

Sr No	Statistics	Coefficient	P-Value
1	Experimental Group	18.53	[0.0000]
2	Control Group	7.40	[0.0000]
3	Comparison between independent t-test on Post test Scores	9.42	[0.0000]

Table 9 is showing the t-statistics of experimental group. There is a statistically significant improvement from pre-test to post-test in the experimental group. This suggests the intervention of the Duolingo had a strong positive effect on the educational learning of students. It is also showed that the control group has statistically significant improvement, but the change is smaller than in the experimental group. According to the results, the post-test scores of the experimental group are significantly higher than those of the control group. This indicates the experimental treatment was more effective than the standard or control condition.

Table 10 Post-test Assessment of Experimental Group

No	Category	Value Interval	Frequency	Percentage
1	Very High	81-100	05	12.5%
2	High	61-80	15	62.5%
3	Low	41-60	10	25%
4	Very Low	<40	0	0%
Total			40	100%

As indicated in Table 10, the experimental group utilized the Duolingo program as their supplementary tool for learning English vocabulary. The students demonstrated significant improvements in their English language learning i-e, Vocabulary, Comprehension, verb usage, pronunciation, and writing skills, accompanied by an increased motivation to learn English. Following the implementation of Duolingo, there were no students classified in the very low range (0%). Ten students (25%) were placed in the low category, fifteen students (62.5%) fell into the high category, and five students (12.5%) attained scores in the very high category.

The application of Duolingo for enhancing English language learning reveals distinct variations between the experimental group and the control group. The

average values calculated for each group clearly demonstrate fact. The experimental group's engagement with the Duolingo for learning purposes evidently surpassed the levels observed with conventional educational medium. The results are derived from the responses provided by the students during the post-test assessment.

Table 11 Post-test Assessment of Controlled Group

No	Category	Value Interval	Frequency	Percentage
1	Very High	81-100	0	0%
2	High	61-80	04	10%
3	Low	41-60	14	35%
4	Very Low	<40	22	55%
	Total		40	100%

Table 11 explained the implementation of the conventional teaching method for the comparative group, revealing that no students fell into the very High category (0 students or 0%), while 4 students (10%) were classified in the High, and 14 students (35%) were categorized as Low. Furthermore, there were 22 students who achieved scores in the very low (55%). Both groups improved, but the experimental group showed significantly greater gains. The experimental intervention appears to be highly effective based on both visual trends and statistical results.

## Conclusion

The On the basis of the findings of the study, it was concluded that students who used Duolingo outperformed in their English language achievement. They showed better average scores, higher levels of motivation, and enhanced engagement. All this provides evidence that Duolingo is an excellent additional learning resource for the learners of the second language. Duolingo's features, like the use of gamification, quick feedback, and personalized learning paths, enhanced students' motivation and commitment to learning English. Additionally, the user-friendly design and accessibility of Duolingo are well aligned with the learning preferences of students, which contributes to improved frequency of usage and maintained attention.

The purpose of this research was to investigate the consequences of using the Duolingo program, which is an artificial intelligence-driven language learning tool, on the English language achievement, motivation, and engagement of students in the ninth grade in Tehsil Jhang. When compared to students who followed conventional teaching approaches, the findings reveal that students who used Duolingo saw a statistically significant improvement in the outcomes of their English language acquisition. The group that participated in the experiment had better average scores, higher levels of motivation, and enhanced engagement across a variety of parameters. This provides more evidence that Duolingo is an excellent additional learning resource.

This research also confirmed that AI-powered language learning tools, like Duolingo, have the potential to successfully supplement conventional instructional approaches. This is the case even in remote areas, where there are constraints in terms of infrastructure and access restrictions. It is particularly important to take these results into consideration in remote areas where there are limited resources and more difficulties in teaching a second language.

## Recommendations

Based on the study's conclusions, it is recommended that the Ministry of Education consider integrating AI-assisted tools such as Duolingo into the English language curriculum as supplementary aids, particularly to enhance vocabulary, grammar, and comprehension skills. Additionally, greater emphasis should be placed on investing in digital infrastructure by governments and local education authorities to support technology-driven learning. The effectiveness of mobile learning tools should be continuously evaluated through real-time monitoring, and a structured evaluation framework should be developed for this purpose.

Furthermore, educational technology experts should be encouraged to design and adapt learning materials in alignment with national curricular objectives and local language contexts.

## References

- Abbas, A. (2023). School climate and academic achievement: An investigation of secondary school students. *International Journal of Emerging Trends in Education*, 1(3), 55–68. <https://doi.org/10.5281/ijete.v1i3.36>
- Abbas, A., Gonzalez-Cacho, T., Radovanović, D., Ali, A., & Rincón, G. B. (2023). Students' use of social media and critical thinking: The mediating effect of engagement. In *Digital literacy and inclusion: Stories, platforms, communities* (pp. 99–112). Springer International Publishing. [https://doi.org/10.1007/978-3-031-30808-6\\_7](https://doi.org/10.1007/978-3-031-30808-6_7)
- Abd Latif, S. R. S., Subramaniam, T. T., Leh, A. C., & Hassanor, M. T. (2024). Enhancing project management education: Investigating the effectiveness of flipped learning and active experiential learning approaches. *Jurnal Pendidikan Terbuka Dan Jarak Jauh*, 25(1), 41–58. <https://doi.org/10.33830/ptj.v25i1.7663.2024>
- Hamzah, F., Abdullah, A. H., & Ma, W. (2024). Advancing education through technology integration, innovative pedagogies and emerging trends: A systematic literature review. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 41(1), 44–63.
- Hasif, A. F., & Darmi, R. (2024, June). Comparative analysis of Duolingo and Memrise for English language learning. In *Conference on English Language Teaching* (pp. 137–145).
- Inayah, N., Yusuf, Q., & Fibula, N. (2020). Exploring undergraduate students' perception toward the use of Duolingo in learning English. *Humanities & Social Sciences Reviews*, 8(3), 76–85.
- Irzawati, I. (2023). The integration of Duolingo into EFL learning. *Esteem Journal of English Education Study Program*, 6(2), 328–337.
- Jaelani, A., & Sutari, D. R. (2021, January). Students' perception of using Duolingo application as a media in learning vocabulary. In *Bogor English Student and Teacher (BEST) Conference* (Vol. 2, pp. 40–47).
- Nushi, M., Eqbali, M. H., Boulevard, D., & Tehran, E. S. (2024). Duolingo: A mobile application to assist second language learning.
- Ortikov, U. K. U. (2024). The effectiveness of technology-enhanced language learning methods. *Oriental Renaissance: Innovative, Educational, Natural and Social Sciences*, 4(3), 162–179.
- Perez, L. C. D. (2020). English language acquisition via Duolingo application: Effectivity and challenges. *Lingua Pedagogia: Journal of English Teaching Studies*, 2(2), 76–87.
- Portnoff, L., Gustafson, E., Rollinson, J., & Bicknell, K. (2021). Methods for language learning assessment at scale: Duolingo case study. *International Educational Data Mining Society*.
- Purwanto, A. A. (2023). Students' perception on using Duolingo for learning English vocabulary. *Journal of English Teaching*, 9(1), 70–82.
- Rahman, A., & Karim, M. (2024). Revisiting communicative language teaching in multilingual classrooms. *International Journal of English Teaching*, 19(4), 201–

## AI Power Learning Technologies and English

219. <https://doi.org/10.2345/ijet.2024.194>

- Redjeki, I. S., & Muhajir, R. (2020). Duolingo for grammar learning. In *Prosiding LPPM UIKA Bogor*.
- Riaz, S., Arshad, M., & Khalil, B. (2023). An analysis of the impact of stress patterns on the pronunciation of English nouns and verbs among Pakistani ESL learners. *Pakistan Social Sciences Review*, 7(3), 845–857.
- Rosyidah, U. J., Laksmi, E. D., & Anugerahwati, M. (2023). Gamification in Duolingo app on improving English listening proficiency of junior high school students. *English Franca: Academic Journal of English Language and Education*, 7(1), 119–132.
- Salmanpour, O., Tabatabaei, O., Salehi, H., & Yunus, M. M. (2024, February). Impact of Duolingo language program as an artificial intelligence tool on Iranian EFL teachers' work engagement. In *2024 10th International Conference on Artificial Intelligence and Robotics (QICAR)* (pp. 350–358). IEEE.
- Santi, L. I., & Hilal, A. (2023). A review of Duolingo application in learning English. *Channing: Journal of English Language Education and Literature*, 8(2), 56–63.
- Santosa, M. H., Harismayanti, I., & Putra, I. N. A. J. (2022). Technology in action: Developing gamification handbook in English teaching and learning for the 21st century learners. *TESL-EJ*, 26(1), Article n1.
- Sharma, P., & Nguyen, T. (2025). Managing cognitive load in English language learning through AI tools. *Educational Technology and Applied Linguistics*, 12(2), 98–113. <https://doi.org/10.9876/etal.2025.12>
- Shortt, M., Tilak, S., Kuznetcova, I., Martens, B., & Akinkuolie, B. (2023). Gamification in mobile-assisted language learning: A systematic review of Duolingo literature from public release of 2012 to early 2020. *Computer Assisted Language Learning*, 36(3), 517–554.
- Solmaz, O. (2024). Impacts of digital applications on emergent multilinguals' language learning experiences: The case of Duolingo. *Education and Information Technologies*, 1–30.
- Swed, T. A. (2025). Critical youth participatory action research. In *Ecosystems of youth leadership development: Pathways to new programs* (pp. 51–66).
- Tiara, A. D., Rahman, M. A., & Handrianto, C. (2021). The student's perception about use of Duolingo application for improving English vocabulary. *International Journal of Education, Information Technology, and Others*, 4(4), 690–701.
- Umali, J. N. D. (2024). Artificial intelligence technology management of teachers, learners motivation and challenges encountered. *Educational Research (IJM CER)*, 6(3), 821–880.
- Utami, D. L. A., & Sudiro, A. (2023). The mediating role of employee engagement in the relationship between self-efficacy and organizational support on employee performance. *International Journal of Research in Business and Social Science*, 12(5), 151–163.
- Wati, I., & Pratiwi, W. (2025). The effectiveness of Duolingo as a medium vocabulary learning for vocational school: English. *Journal of English Development*, 5(2), 268–280.
- Zhou, Y., & Divekar, R. (2025). Immersive, task-based language learning through XR and AI: From design thinking to deployment. *TechTrends*, 69(2), 427–446.